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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/663,585	09/18/2000	Volker Stahl	PHD 99-124	4107

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EXAMINER

STORM, DONALD L

ART UNIT	PAPER NUMBER
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2654

DATE MAILED: 01/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/663,585

Applicant(s)

STAHL ET AL.

Examiner

Donald L. Storm

Art Unit

2654

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114.

The Applicant's AMENDMENT AFTER FINAL REJECTION, filed on October 8, 2004, has been entered. An action continuing examination on the merits follows. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Informalities

2. Claim 5 is objected to under 37 CFR 1.75(a) because the meaning of the phrase "the letter speech recognition unit" (line 7) needs clarification. Because no letter speech recognition unit was previously recited, it may be unclear as to what element this phrase refers. To further timely prosecution and evaluate prior art, the Examiner has interpreted this phrase to refer to -- the letter speech recognition--.

3. The Examiner notes, without objection, the possibility of informalities in the claims. The Applicant may wish to consider changes during normal review and revision of the disclosure.

In claim 6, third- and second-to-last lines, should the phrase "restricting to a vocabulary" be --restricting a vocabulary--?

Claim Rejections - 35 USC § 103

Junqua and Fujisaki

4. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Junqua et al. [US Patent 5,799,065] in view of Fujisaki et al. [US Patent 5,392,363], both already of record.

5. Regarding claim 1, Junqua [see Fig. 5] and Fujisaki [see Fig. 3, decoding mode] make a speech recognition embodiment recognizable as a whole to one versed in the art by explicitly describing the content and functionality of the recited limitations as the following terminology. In particular, Junqua describes:

a letter-sequence estimating (first) stage using a letter speech recognition unit based on HMM [at column 8, lines 55-66, as represent N-best possible spelled combinations of letters analyzing by HMM speech recognition as each letter is spoken];

a post-processing stage for the estimated letter sequence using a statistical letter sequence model for the speech recognition [at column 7, line 62-column 8, line 11, as a predefined letter grammar of pairs of letters and associated probability used in decoding the speech into letter hypotheses by the speech recognizer];

a post-processing (second) stage for the estimated letter sequence using a statistical model for the speech recognition [at column 10, line 57-column 11, line 12, as highly constrained alignment to evaluate the N-best hypotheses by DP alignment using HMM];

using dynamic programming during post-processing [at column 10, lines 60-63, as dynamic programming alignment compares the N-best hypotheses resulting from the recognizer];

dynamic programming is based on a grid with nodes [see Fig. 9, axes, hypotheses points, and their description, especially at column 12, lines 6-23, as the N-best hypotheses analysis here being the lattice technique that computes for each node];

the nodes are provided for assignment to probability values [at column 12, lines 7-10, where a computed likelihood is for each grammar node and the best (hypothesis) probabilities are stored];

the node's probability values have been accumulated [at column 9, lines 8-10, as paths are represented by probability matches from the beginning of the utterance];

the grid is converted into a tree [see Fig. 16, items n1, w1, na, etc. their connections, and their descriptions especially at column 12, lines 32-62, as prioritize the ending nodes as the vertical column, expand the node to the hypothesis that generated the node, in turn identify the node that generated the hypothesis, proceed in that manner until a starting node is identified];

use an algorithm for finding an optimum tree path [at column 12, line 36-column 13, line 2, as the backtracking algorithm sorts and substitutes higher scoring nodes such that the string through the first nodes in the queue represents the hypothesis with the highest score when a starting node has been found].

However, Junqua does not explicitly describe the using the A* algorithm.

Fujisaki [see Fig. 27] describes an embodiment of recognition of letters of the alphabet using a tree structure corresponding to paths through a Viterbi lattice. Fujisaki also describes:

use an algorithm for finding an optimum tree path [at column 20, lines 22-61, as operate a search method to access a d-node of the vocabulary trie to determine probabilities and the maximum probability corresponding to the associated path];

use the A* algorithm [at column 17, lines 41-62, as the beam search technique is referred to as algorithm A*].

As indicated, Fujisaki shows that the A* algorithm and its use in tree searching was known to artisans at the time of invention. Since Fujisaki [at column 17, lines 34-43] points out the A* algorithm is a preferred beam search technique because of its efficiency, it would have been obvious to one of ordinary skill in the art of dynamic programming at the time of invention to include the concepts described by Fujisaki at least the A* algorithm with Junqua's DP search because Fujisaki shows its suitability in that role and that would bring the known A* search efficiencies to Junqua's beam search.

Junqua [at Fig. 5, item 26 and columns 7-8] describes item 26 as a speech recognition unit of HMM recognition that decodes utterances of letters to output N-best letter hypotheses. Junqua [at column 8, lines 8-11] says that the letter grammar is used by the speech recognizer. However, Junqua does not describe details of using the letter grammar in the speech recognizer. In particular, Junqua does not explicitly describe a letter speech recognition unit not using a letter grammar which denotes probabilities of the occurrence of different possible letter combinations in which a letter sequence is estimated.

Fujisaki also describes:

a letter grammar which denotes probabilities of the occurrence of different possible letter combinations [at Fig. 3, item 26, and column 9, lines 23-26, as a language model block that provides probabilities to determine what characters are most likely to be used in a given context];

a letter speech recognition unit in which a letter sequence is estimated not using the letter grammar [at Fig. 3, item 28, and column 9, lines 14-43, as the likelihood estimator block

that the produces candidate characters for the decoder to integrate with the language model shown as input to the decoder, but not shown as input to the likelihood estimator of candidate characters].

As indicated, Fujisaki shows that a letter speech recognition unit not using a letter grammar which denotes probabilities of the occurrence of different possible letter combinations in which a letter sequence is estimated was known to artisans at the time of invention. Fujisaki's decoding mode shown in Fig. 5, item 18, shows parallel inputs of prototype models and a language model in the same way that Junqua shows parallel inputs of letter models and bigram on the letters to speech recognition unit 26 of Fig. 5. The discussion by Junqua indicates the use of a bigram letter grammar, trigram letter grammar, or other letter grammar, but does not describe how to use the letter grammar to decode utterances of letters to output N-best letter hypotheses from the speech recognition unit. In view of the similarities between Junqua's and Fujisaki's recognition units, it would have been obvious to one of ordinary skill in the art of speech pattern recognition at the time of invention to include the concepts described by Fujisaki at least of a letter speech recognition unit not using a letter grammar which denotes probabilities of the occurrence of different possible letter combinations in which a letter sequence is estimated because Fujisaki the description that Junqua lacks of how Junqua's use of a bigram letter model may be implemented.

6. Regarding claim 2, Junqua also describes:

determining sub-optimum paths for the utterance corresponding to N best estimates with $N > 1$ [at column 8, lines 17-50, as yield the N-best hypotheses that deviate from the best score no more that a beam width any N greater than 1];

the paths are tree paths [see Fig. 16, items n1, w1, na, etc. their connections, and their descriptions especially at column 12, lines 32-62, as the ending nodes are expanded to the hypothesis that generated the node, in turn identify the node that generated the hypothesis, proceed in that manner until a starting node is identified].

7. Regarding claim 3, Junqua also describes:

during the search for an optimum tree path those tree paths that have a small probability are not searched [at column 8, lines 46-50, as implements a beam search whereby the least likely search paths are pruned so that only the best hypotheses are returned & at column 9, lines 8-10, as paths are represented by probability matches from the beginning of the utterance].

Junqua and Fujisaki and Cecinati

8. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Junqua et al. [US Patent 5,799,065] in view of Fujisaki et al. [US Patent 5,392,363] and Cecinati et al. [US Patent 4,907,278], all already of record.

9. Regarding claim 4, Junqua [at Fig. 5 and column 3, line 67] also describes DSP implementation of the speech recognition functions that are described as separate functional blocks. Fujisaki [at Fig. 3 and columns 8-9] describes an implementation on a general purpose computer of the functional blocks of the recognizer. Although Fujisaki suggests different implementation mechanisms for the functions of the recognizer, neither Fujisaki nor Junqua explicitly describes first and second ICs implementing different functions of the processing.

Cecinati [at column 9, lines 61-66] also describes HMM speech recognition using dynamic programming. Cecinati also describes:

a first processing stage [at column 5, lines 1-5, as a master that supplies a list of data relative to grammar arcs to be searched by a slave];

a second processing stage [at column 5, lines 1-11, as slave processes that supply hypotheses and a list of surviving paths that were not pruned from a list of data relative to grammar arcs that were supplied by a master to be searched by a slave];

a first IC for the first stage and a second IC for the second stage [at column 1, lines 7-20, as a higher-level master integrated circuit and a lower-level slave integrated circuit].

Cecinati [at column 1, lines 24-46] points out that the division of processing is advantageous to providing real-time speech recognition because the processing can be started as parts of the utterance are received, rather than waiting until its ending. It would have been obvious to one of ordinary skill in the art of digital signal processing at the time of invention to include Cecinati's concept of faster processing by separating the different functions of Junqua's and Fujisaki's recognition processing onto a first and a second IC because the results could be determined faster by processing the different functions, corresponding to preceding and following portions of the utterance data, at the same time as the characters are entered.

Junqua and Fujisaki and Attwater

10. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Junqua et al. [US Patent 5,799,065] in view of Fujisaki et al. [US Patent 5,392,363] and Attwater et al. [US Patent 5,940,793], all already of record.

11. Claim 5 sets forth limitations similar to limitations set forth in claim 1. Junqua and Fujisaki describe and make obvious the limitations as indicated there. Junqua and Fujisaki describe only letter speech recognition for spelled recognition of database words (names). Neither Junqua nor Fujisaki explicitly describes inputting and recognizing a whole word.

Attwater [at column 8, lines 10-25] describes an embodiment for spelled word recognition of database words (names). Like Junqua and Fujisaki, Attwater [at column 5, lines 24-55] uses a decoding tree structure and the Viterbi algorithm. In addition, Attwater describes:

inputting a whole word and recognizing the whole word that is input using word speech recognition [at column 6, lines 16-41, as the name of a town is received from a telephone call by the recogniser and the recogniser communicates the name of the town that most closely resembles the received reply (from the telephone call) with reference to the data stored in the name stores];

the whole word serves as a control signal [at column 8, lines 45-51, as the town names previously recognized are used to prepare road name recognition];

part of this word is input in spelled form and the spelled part is recognized [at column 8, lines 10-25, as receipt of letters of the spelled version of the name for recognition of a sequence of names of letters of the alphabet for a town name recognition]; and

restricting a vocabulary assigned to the word speech recognition to the recognition results of the letter speech recognition [at column 8, lines 10-25, as the list of words for town name recognition prepared from an earlier recognition of a sequences of names of letters of the alphabet].

As indicated, Attwater shows that speech recognition by whole word recognition using a vocabulary restricted by letter speech recognition was known to artisans at the time of invention. Attwater [at column 5, lines 49-55] points out that restricting the active subset of the tree to be searched allows resources to be concentrated on the most likely words and should reduce erroneous recognition results. Following Attwater, it would have been obvious to one of ordinary skill in the art of speech recognition at the time of invention to include the concepts described by Attwater at least recognition of letter inputs to restrict the vocabulary of a word recognition process because the resources could be concentrated on the mostly spoken input and errors in recognition results would be lessened.

Attwater and Cecinati

12. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Attwater et al. [US Patent 5,940,793] in view of Cecinati et al. [US Patent 4,907,278], both already of record.

13. Regarding claim 6, Attwater [at title] and Cecinati make a speech-controlled embodiment recognizable as a whole to one versed in the art by explicitly describing the content and functionality of the limitations recited in the body of the claim as the following terminology.

In particular, Attwater describes:

receiving a whole word and recognizing the whole word using word speech recognition [at column 6, lines 16-41, as the name of a town is received from a telephone call by the recogniser and the recogniser communicates the name of the town that most closely resembles the received reply (from the telephone call) with reference to the data stored in the name stores];

the whole word serves as a control signal [at column 8, lines 45-51 , as the town names previously recognized are used to prepare road name recognition];

receiving part of this word in spelled form and recognizing the spelled part [at column 8, lines 10-25, as receipt of letters of the spelled version of the name for a town name recognition];

the spelled part recognition uses letter speech recognition [at column 8, lines 10-18, as the list of words to be recognized may be names of letters of the alphabet]; and

restricting to a vocabulary assigned to the word speech recognition to the recognition results of the letter speech recognition [at column 8, lines 10-25, as the list of words for town name recognition prepared from an earlier recognition of a sequences of names of letters of the alphabet].

Attwater describes the algorithm and an apparatus to provide the described functionality of HMM speech recognition; however, Attwater does not explicitly describe executing code.

Cecinati [at column 9, lines 61-66] also describes HMM speech recognition using dynamic programming. Cecinati also describes:

first and second processing units [at column 1, lines 7-20, as a higher-level master integrated circuit and a lower-level slave integrated circuit];

the processing units are for executing code [at column 1, lines 7-10, as the ICs are microprogrammed for employment in speech recognition systems].

The many teachings of Attwater imply, but do not explicitly describe, processing units executing code for implementation of the algorithms. To the extent that a programmed processor is not necessarily part of Attwater's system, it would have been obvious to one of ordinary skill in the computer and electronic arts at the time of invention that Cecinati's

concept of programmed ICs could be used with program segments in accordance with Attwater's teachings because programmed processor implementation would eliminate the tedium of manual calculation of repetitive operations.

Response to Arguments

14. The prior Office action, mailed August 18, 2004, rejects claims under 35 USC § 112, under § 103, citing Junqua and others, and under § 103, citing Attwater and others. The Applicant's arguments and changes in AMENDMENT AFTER FINAL REJECTION, filed on October 8, 2004, have been fully considered with the following results.

15. With respect to rejection of claims 3-6 under 35 USC § 112 as lacking description in the disclosure as filed, the changes entered by amendment claim subject matter that can be identified in the specification as filed. Accordingly, the rejections are removed.

16. With respect to rejection of claims 1-5 under 35 USC § 103 citing Junqua and Fujisaki in combination, the Applicant's arguments appear to be as follows:

a. The Applicant's argument appears to be that Junqua always employees a bigram letter grammar and associated probability in letter recognition and that Fujisaki does not describe a letter speech recognition unit that does not use a letter grammar which denotes probabilities of the occurrence of different possible letter combinations. This argument is not persuasive because Fujisaki shows the letter recognition unit that does not use probabilistic letter combinations in Fig. 3, item 28, as the likelihood estimator of letter character candidates. The letter sequence probabilities of the language model are next applied to those recognized

character candidates in the decoder, item 30, to produce recognized handwriting as output of the decoding mode.

b. The Applicant's argument appears to be that a device resulting from the combination of Junqua and Fujisaki fails to include all the elements recited as claim 1 and other claims dependent to or similar to claim 1 because Junqua uses a bigram letter grammar and Fujisaki recognizes from combinations of letter strokes. This argument is not persuasive because the combination of Junqua and Fujisaki describes all subject matter of claim 1 using the terminology at the passages that are specifically cited elsewhere in this Office action.

c. The Applicant's argument appears that there is no suggestion to combine Junqua and Fujisaki. This argument is not persuasive because their combination takes into account only knowledge that was within the level of ordinary skill at the time the claimed invention was made; therefore, such a reconstruction is proper. One of ordinary skill in the art of speech pattern recognition would be familiar with its correspondences to handwriting pattern recognition, which is another application of pattern recognition. The test for motivation to combine, then, is whether an artisan, being familiar with all that the references disclose, would have found it obvious to make a structure corresponding to what is claimed. The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art, and all teachings in the prior art must be considered to the extent that they are in analogous arts. In this case, the reasons are given as the benefits indicated in the statements of the rejection.

The Applicant's arguments have been fully considered but they are not persuasive. Accordingly, the rejections are maintained.

17. With respect to rejection of claim 6 under 35 USC § 103 citing Attwater and Cecinati, the Applicant's arguments appear to be as follows:

The Applicant's argument appears to be that Attwater's word responses that limit the vocabulary for subsequent recognition do not include recognition of letters of the alphabet. This argument is not persuasive because Attwater [at column 8, lines 10-25] describes an earlier recognition of a sequences of names of letters of the alphabet that restricts the list of words for subsequent town name recognition.

The Applicant's arguments have been fully considered but they are not persuasive. Accordingly, the rejection is maintained.

Conclusion

18. Any response to this action should be mailed to:

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19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donald L. Storm, of Art Unit 2654, whose telephone number is (703) 305-3941. The examiner can normally be reached on weekdays between 8:00 AM and 4:30 PM Eastern Time. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richemond Dorvil can be reached on (703) 305-9645.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Inquiries regarding the status of submissions relating to an application or questions on the Private PAIR system should be directed to the Electronic Business Center (EBC) at 866-217-9197 (toll-free) or 703-305-3028 between the hours of 6 a.m. and midnight Monday through Friday EST, or by e-mail at: ebc@uspto.gov. For general information about the PAIR system, see <http://pair-direct.uspto.gov>.

January 11, 2005

Donald L. Storm
Donald L. Storm
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